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*Research*  
**IN INTERREGIONAL  
COMPETITION**



*By*

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# RESEARCH IN INTERREGIONAL COMPETITION IN AGRICULTURE

By Ronald L. Mighell, senior agricultural economist

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## CONTENTS

	Page
Introduction .....	1
How can regional trends be studied .....	3
Interregional competition in dairying .....f.....	6
Trends in dairying by major type-of-farming regions .....	8
The probable effects of the Agricultural Conservation Program on livestock production in the Midwest dairy region .....	10
Competition in dairying between the Great Lakes States and New England .....	14
Interarea comparisons .....	26
Applications to agricultural planning and department programs .	28
Public information aspects .....	29
The National Defense Program .....	30
Publications on interregional competition .....	31

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## INTRODUCTION

Research in interregional competition was one of the projects undertaken in the Department of Agriculture with the special research fund authorized by the Bankhead-Jones Act of 1935. The practical need for the results of such research is underscored by the impact of the present conflict abroad upon the agriculture of the United States.

The war has brought into sharp focus the now familiar picture of the long period of shrinking foreign markets for wheat, cotton, tobacco, and certain other farm products. Even though the peace that will finally come may usher in an era of freer international trade, it does not now appear likely that this Nation will ever again find as large an export market for these products as in former times. In that event, the agriculture of the regions producing the great export farm products must inevitably undergo a major readjustment.<sup>1/</sup>

In this adjustment, some of the resources of these regions will be shifted toward the production of other domestically consumed commodities. Dairy and poultry products, meat animals, fruits and vegetables

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<sup>1/</sup> U. S. Dept. of Agriculture. "Regional Adjustments to Meet War Impacts." October 1940, 65 pp. (Processed.)



will be among these more favorable alternatives. Subsequent increases in their production will have repercussions on present sources of supply in other regions. Expanding domestic markets will need to be relied upon greatly to keep supplies from new sources from bearing heavily on present producers. Dairyman in Wisconsin, for example, are concerned about the continuing trend toward more milk production in the South. Hog producers in Iowa fear increasing competition from new producing areas outside the Corn Belt.

Research and planning to determine the most desirable farm adjustments in any area or region will need, therefore, to take into account trends in production in competing regions. Furthermore, as better means for putting agricultural plans into effect now exist in the various agricultural programs, it is also necessary to take account of the probable production effects of the suggested adjustments themselves.

Determination of the most desirable farm adjustments within a local area turns around forces which may be termed external and internal to the farm. Internal factors include the resources of the individual farm and the farmer's capabilities and limitations. External factors are in the main reflected in prices. A careful consideration of these two sets of factors will enable one to make approximate budgets of receipts and expenses for different combinations of farm enterprises with a view to finding out what individual farmers in the various areas should grow, in order to benefit themselves and the Nation in the highest degree. It is in this way that much of our local adjustment analysis can be brought to a focus.

Several years ago this approach was outlined as follows: "This budgeting or estimation of receipts and expenses is of necessity based upon future and therefore unknown prices. And it is just at this point that the question of regional competition among farmers comes in for consideration. The prices which farmers in a given region may expect to get for their products will depend in a large measure upon the quantities of those products supplied from that and competing areas. Prospective demand must also be considered, but the important thing from the standpoint of competition between regions is the effect which future supplies from all the areas supplying a common market will have upon the price." 2/

This was written in 1926 before the present types of agricultural programs were available and would no doubt be modified today. Not only do the present programs influence supplies of farm products, but they also affect consumption. The new institutions for distributing surplus products to low-income groups and the means for promoting the

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2/ Tapp, Jesse W. "The Principle of Comparative Advantage Applied to Farm Management Studies of Regional Competition Between Farmers." Jour. Farm Econ. 8:417-426. 1926.

development of more economical methods of distribution will have a profound influence on interregional competition. It is quite possible, for example, that much of the expansion in dairy production expected in many new areas will be needed to meet new demand.

Research in interregional competition is therefore concerned with trends in production and consumption, with the underlying causes for the trends and with their probable future direction. The final objective of such research is to contribute to the total agricultural adjustment process by making available the best possible information about the effects of factors "external" to the farm and the local planning area.

#### HOW CAN REGIONAL TRENDS BE STUDIED

The general reason why individual farmers tend to change their output over a period of time is simple. So far as they can, they try to obtain the most income for the farm family from their available resources. As prices change, as new farm practices appear, as their resources wear out, and as they themselves change, there are resulting changes in the most profitable combination of crops and livestock, and adjustments are made.

The general principle formulated by economists to explain the whole process of adjustment by which these changes come about is known as the principle of comparative advantage. This principle merely states that producers of every locality tend to use their resources in the production of those goods in which their income advantage is comparatively highest.

Like many broad principles in economics and other sciences, the principle of comparative advantage is of little practical use until it is actually worked out for particular situations. In the past, specialists in problems of international trade have been the ones most concerned with the principle. And in international trade a comparatively crude type of static analysis has usually sufficed to indicate the gains that would be likely to flow from a change in trade relationships.

Many of the farm-management and price studies of the last 20 years have added to our knowledge of how farmers in the mass and as individuals respond to prices and other forces affecting farming. The statistical investigations known as "farmers' response" studies have come the nearest to what is needed for an understanding of how interregional competition works itself out. Statistical analysis of time series of prices and other factors and farmers' subsequent response in production have been made for a number of commodities. Hogs, cotton, flax, milk may be mentioned as examples of commodities

so studied.<sup>3/</sup> In these studies definite relationships have been established. In the case of hogs, for example, it has been shown that the hog-corn ratio definitely affects farmers' response in hog production, and that other price and nonprice factors are also important. Differences in response in different regions have also been measured.

The major attention in these studies has been centered on relatively short-term changes covering only a year or so at most. Little has been done to give an adequate explanation of longer-time trends or any definite way of estimating the probable supply of any farm product that might be forthcoming, say 10 years later, if its price should rise (or fall) 15 percent and producers had reason to believe it would stay there. Neither has sufficient attention been given to the probable long-run effects of new technological developments, or of new institutions like crop insurance or agricultural conservation.

A principal reason for lack of progress in the analysis of the longer-time supply responses is that the appropriate research procedures have been more difficult to develop. The statistical approach that has been useful for short-time changes cannot be applied with much success to trend problems that involve a projection into the future. This is because past experience does not include enough different observations of most of the factors, and in some cases there is no experience at all. Many entirely new items are continually entering the stream of events and upsetting past relationships. Hybrid corn, for instance, changes all of our previous calculations on feed production.

How then can the trend problem be treated? A general basis for an appropriate attack has been described by Black.<sup>4/</sup> This has been further developed in an earlier report by the workers on this project.<sup>5/</sup>

<sup>3/</sup> Ezekiel, Mordecai, Rauchenstein, Emil, and Wells, Oris V. "Farmers' Response to Price in the Production of Market Milk." U. S. Bur. Agr. Econ. 16 pp. May 1932. (Processed.)

Wells, Oris V. "Farmers' Response to Price; A Selected Bibliography." U. S. Bur. Agr. Econ. 28 pp. April 1933. (Processed.)

Bean, L. H. "The Farmers' Response to Price." Jour. Farm Econ. 11: 368-385, illus. 1929.

Elliott, F. F. "Adjusting Hog Production to Market Demand." Ill. Agr. Expt. Sta. Bul. 293, pp. 503-567, illus. 1927.

Smith, B. B. "Forecasting the Acreage of Cotton." Amer. Statis. Assoc. Jour. 20: 31-47, illus. 1925.

<sup>4/</sup> Black, John D. "Interregional Competition in Agricultural Production .... In Research in Farm Management--Scope and Method .... (Social Sci. Res. Council Bul. (1932) 13): 87-101. 1932.

<sup>5/</sup> Johnson, Sherman E., Hady, Frank T., Mighell, Ronald L., Allen, R. H., and Hole, Erling. "Analysis of Interregional Competition in Agriculture." U. S. Bur. Agr. Econ. 74 pp. April 1939. (Processed.)



The suggested procedure consists in carefully analyzing developments and past trends in selected areas, and then estimating for each of several possible sets of conditions how much milk, for example, is likely to be produced at a time some years in advance.

The forward estimating may be carried out at several levels of intensity. It may consist only of a qualitative projection based mainly on past trends and such new factors as may be recognized. An example of this type of approach is a recent study of cotton production in southern Brazil. <sup>6/</sup> In this study the recent very rapid rise in cotton production in São Paulo is noted. The reasons for the rise are examined, and the possibilities for further expansion are explored. Although no quantitative estimates of future trends are stated, the reader is left with a rather definite impression of what is in prospect. Quantitative estimates may sometimes be made by building up from area or regional totals. For example, the effects of hybrid-seed corn on corn production might be approximated by applying estimated percentage increases to the average United States yield; or the estimate could be improved by working with State yields. A still better result would be attained if yield series were available for areas with similar production conditions.

A more intensive quantitative method is to construct estimates from individual farm data. This is the method to which most attention has been given in this study.

By means of individual farm records and related data, the past period is carefully examined in each representative area. Not changes over the period are noted and explained. For the period ahead, individual farm budget estimates are prepared for each of several sets of conditions as to prices and other factors. In this budgeting process, careful comparisons are made between the returns from various alternative organizations that are possible under the conditions considered. The area summations of the individual estimates are further adjusted for those factors that cannot be adequately treated on an individual farm basis. The final result then shows the probable output for each of the several sets of conditions for a period some years ahead.

The general plan of the current research in interregional competition has been to examine and inventory existing research material bearing on interregional competition problems, and to undertake quantitative analysis of the production phases. An examination of regional trends in dairying in major type-of-farming regions has been made. <sup>7/</sup>

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<sup>6/</sup> Herrmann, Omar W. "South Brazil, New Land of Cotton." Farm Credit Adm. U. S. Dept. Agr. Circular C-117, 47 pp., illus. 1940.

<sup>7/</sup> Finner, W. F. and Mighell, Ronald L. "Trends in Dairying by Major Type-of-Farming Regions." U. S. Dept. Agr. Tech. Bul. 751, illus. (In press.)

The probable effects of the agricultural conservation program on the Midwest dairy regions has been estimated. Selected dairy areas in New England and the Great Lake States have been studied in detail in order to determine the advantage of each selected area and the two regions in dairying now and in the future. This report discusses some of the preliminary results of the project with special emphasis on the study of dairying.

### INTERREGIONAL COMPETITION IN DAIRYING

For many years a marked and fairly continuous upward trend in the number of milk cows and milk production on farms in the United States has been noted. As indicated in figure 1, dairying has shown little cyclical tendency although an unusually large increase in numbers occurred from 1929 to 1934. This was followed by a 4-year decline and then by a resumption of the upward movement. Milk production has shown a persistent upward drift except during the drought-affected years of the 1930's.

So long as total population in the United States was growing rapidly, there was less cause for concern. But now that population trends are flattening out, it is important to inquire into the causes back of the upward trend in milk production. Are these causes so related to population growth that its slowing down will be accompanied by a similar change in the upward trend in milk production? Or are there dominant forces that will continue the upward movement with a stationary population and lower milk prices?

Before these questions can be answered, it is necessary to know more about long-time consumption responses on the one hand and dairy farmers' long-time production responses to prices and other factors on the other. And these need to be studied on a regional and area basis.

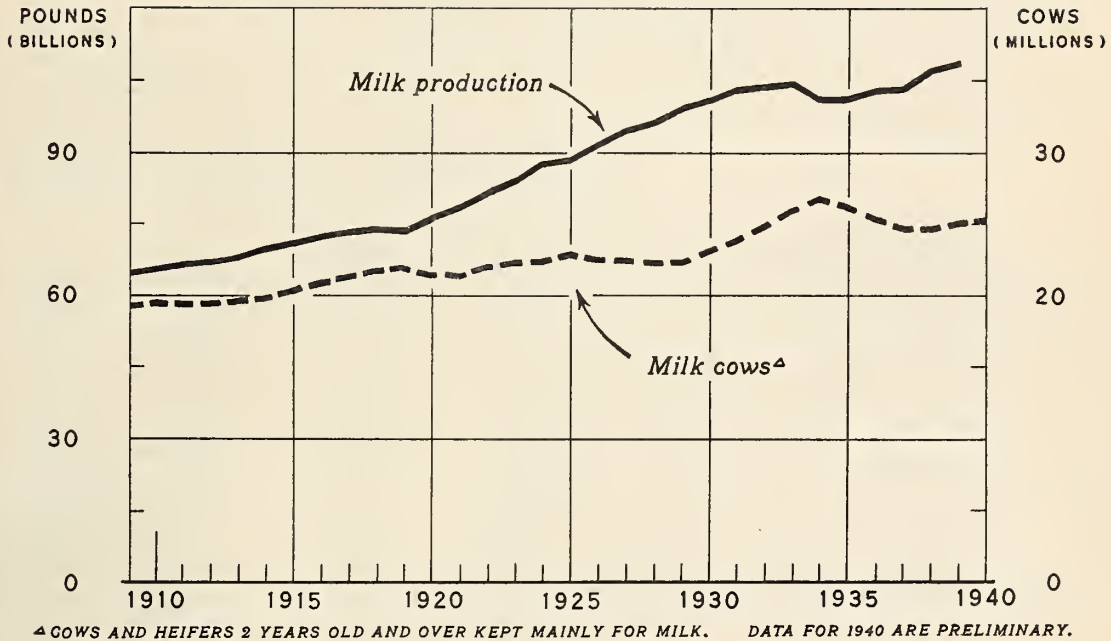
The interregional competition research in dairying has included three types of studies:

- (1) An exploratory study of trends in dairying in the United States by major type-of-farming regions (see footnote 7)
- (2) A study of the probable effects of the agricultural conservation program on livestock production in the Midwest dairy region 8/
- (3) Supply response studies of selected areas in two dairy regions--the Great Lakes States and New England 9/

8/ Johnson, Sherman E., Mighell, Ronald L., and Hady, Frank T. "Probable Effects of the Agricultural Conservation Program on Livestock Production in the Midwest Dairy Region." Parts I-V. January 1940. (Processed.)

9/ Christensen, Raymond P. and Mighell, Ronald L. "Supply Responses in Milk Production in Dodge and Barron Counties, Wisconsin." U. S. Dept. Agr. Tech. Bul. 750, illus. (In press.)

Allen, R. H., Hole, Erling, and Mighell, R. L. "Supply Responses in Milk Production in the Cabot-Mershfield Area Vermont." U. S. Dept. Agr. Tech. Bul. 709, 60 pp., illus. 1940.



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FIGURE 1.- TOTAL ANNUAL MILK PRODUCTION AND NUMBER OF MILK COWS ON JANUARY 1 ON FARMS IN THE UNITED STATES, 1909-40.

Since 1909 there has been a significant and fairly continuous upward trend in milk production and in the number of milk cows on farms.



# TRENDS IN DAIRYING BY MAJOR TYPE OF FARMING REGIONS

The data in table 1 show the increases in milk cow numbers from January 1, 1928 to 1939 by major type-of-farming regions. The regions used are the generalized type-of-farming regions shown on the map prepared by the Bureau of Agricultural Economics in 1935.<sup>10/</sup> Unpublished county data on milk cow numbers made available by the Agricultural

Table 1.- Number and increase of milk cows and heifers 2 years old and over on farms by major type-of-farming regions in the United States, 1928-39

Region	Milk cows		Increase	
	1928	1939	Number	Percent- age
	Thousands	Thousands	Thousands	Percent
Mixed Farming .....	1,793	1,950	157	8.8
Fruit and Mixed Farming .....	1,001	1,133	132	13.2
Range Livestock .....	988	1,031	43	4.4
Wheat and Small Grains .....	1,687	1,741	54	3.2
Dairy .....	5,572	6,253	681	12.2
Corn Belt .....	4,752	5,158	406	8.6
General Farming .....	1,992	2,337	345	17.3
Cotton Belt .....	2,904	3,612	708	24.4
Self-Sufficing .....	375	457	82	21.9
Special Crops .....1.....	849	955	106	12.5
Tobacco and General Farming ....	774	894	120	15.5
Truck .....	139	151	12	8.6
United States <u>1/</u> .....	22,231	25,088	2,857	12.9

1/ The regional numbers add to a slightly different total due to some overlapping of regional boundaries.

Computed from data from U. S. Department of Agriculture, Agricultural Marketing Service.

Marketing Service for the years 1928 to 1939 have been summarized in accordance with these regional divisions.

<sup>10/</sup> United States Agricultural Adjustment Administration. "Regional Problems in Agricultural Adjustment." 101 pp., illus. 1935.



Although milk cows increased in all regions, considerable difference in the rates of increase is found. Percentage increases were higher than average in the Cotton Belt, the Self-Sufficing Areas, the General Farming Region, and the Tobacco and General Farming Region. Percentage increases in the Corn Belt, the Mixed Farming Region, Truck Areas, the Range Livestock Region, and the Wheat and Small Grains Region were less than average.

An examination of the factors associated with the changes in each region indicates that in certain regions special circumstances that may not continue were significant during the period. Thus, the increases in the Range Livestock Region and the Wheat and Small Grains Region from 1928 to 1939 were curtailed by drought. The large reduction of cotton acreage in the South, and the increase in the number of self-sufficing farms during the depression years are also factors that may be different in the next decade.

Estimates of milk production by type-of-farming regions are not available for all of the regions mentioned above. However, for the principal regions they show that the Dairy Region contributed most to the rise in milk production during the period. It was followed closely by the Cotton Belt and Corn Belt. The three regions together accounted for 65 percent of the total increase in milk production on farms from 1928 to 1938.

In examining the utilization of the additional milk production, significant regional differences are found. A larger proportion of the additional milk production went into manufactured products in the Dairy Region and the Corn Belt than in the Cotton Belt. Much of the additional milk produced in the Cotton Belt and in some of the other regions appears to have been consumed locally. In the Cotton Belt the percentage increase in the consumption of fluid milk and cream in cities and villages and on farms has been higher than the average increase in the United States in recent years.

After examining the available evidence as carefully as possible, it was concluded that the greatest competition which any northern dairyman might expect to face for the next decade would be in the Northern Dairy Region itself and perhaps from the Corn Belt. The technological changes under way in these regions, which seem to indicate definitely more feed for dairy cows, point in this direction. A probable further increase in alfalfa production, improved cropping, lining and fertilizer practices, and the increase of hybrid corn in the Corn Belt all appear to reinforce this conclusion.

This prospect was one of the reasons for making a special study of the probable effects of the Agricultural Conservation Program on livestock production in the Midwest dairy region. It also influenced the choice of the Great Lakes States and New England as regions for more intensive study of selected areas to determine quantitatively

the longer term responses that might be expected in dairying.

In the light of present world events and the prospect that needed adjustments in the South may be speeded up and given still greater assistance by action designed to further the National Defense Program, the above conclusions may need to be modified.

#### THE PROBABLE EFFECTS OF THE AGRICULTURAL CONSERVATION PROGRAM ON LIVESTOCK PRODUCTION IN THE MIDWEST DAIRY REGION

It has been recognized all along that the various agricultural programs might cause considerable readjustment in agriculture both within and between regions in addition to the adjustments for which they were planned. Some of these readjustments would be desirable and would tend to cushion further the shock of the changes that would take place in the absence of such programs. Others might call for modification of the agricultural programs if the main production objectives were to be attained. Readjustments seemed especially likely to follow the Agricultural Conservation Program with its emphasis on a shift from soil-depleting to soil-conserving crops. As the latter consist mainly of roughage crops, it appeared probable that roughage-consuming livestock would be increased. Furthermore, trends toward more alfalfa and improved hay and pasture practices already under way would undoubtedly be strengthened.

Areas in Minnesota, Wisconsin, Michigan, and Iowa were selected for intensive study in 1936 and 1937. These are shown in figure 2. Farm-management records, AAA worksheets, and other pertinent data were analyzed as a basis for estimating probable changes in feed supplies and dairy production in each area.

As farmers have many alternatives both in kind and degree of participation in the conservation program, it was difficult to predict the precise adjustments they would make. The problem of estimation was therefore approached from the viewpoint of determining limits for the effects of the program during the next 5 or 6 years. Three steps were involved: (1) Calculating the possible changes in crop production; (2) analyzing the ways of distributing the changed feed supply among the different types of livestock and estimating the resulting changes in their production; and (3) estimating the effects of such changes on farm income.

Table 2 shows percentage changes in total digestible nutrients that were estimated as probable results from the program. Full participation and acreage shifts from depleting to conserving crops sufficient to obtain maximum payments were assumed.<sup>11/</sup> The decreases

<sup>11/</sup> These estimates were made on the basis of the 1937 Agricultural Conservation Program. Subsequent changes have modified somewhat the details of the program.

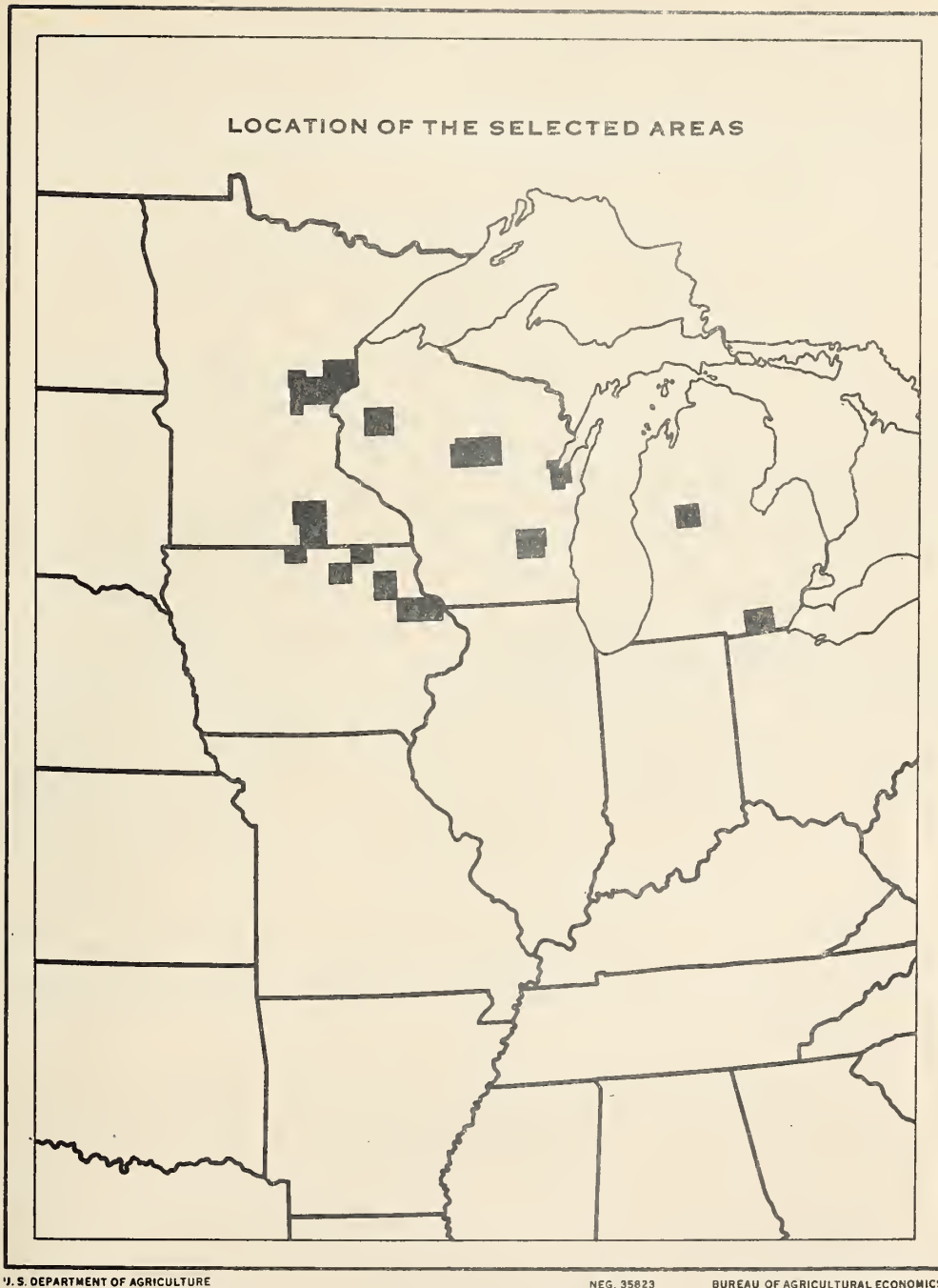


FIGURE 2.- LOCATION OF THE MIDWEST DAIRY AREAS SELECTED FOR STUDY  
OF THE PROBABLE EFFECTS OF THE AGRICULTURAL CONSERVATION  
PROGRAM ON LIVESTOCK PRODUCTION.



in depleting crops were divided between corn and small grain approximately in proportion to their 1935 acreages, and the increases in conserving crops were added to alfalfa and clover and timothy hay approximately in proportion to the 1935 acreages of alfalfa and all other tame hay. The estimated changes in feed nutrients vary from a 1.6 percent decrease in north-central Wisconsin to a 9.0 percent increase in southeastern Minnesota. It seems significant that the only net decrease was in an area where

Table 2.- Area estimates of percentage changes in total digestible nutrients from participation in the program as compared with the 1935 crop pattern

Area	Percentage change in T.D.N.
<u>Corn Belt Transition Areas</u>	
Northeastern Iowa .....	+ 2.6
Southeastern Minnesota .....	+ 9.0
Southeastern Wisconsin .....	+ 2.7
Southeastern Michigan .....	+ 5.4
<u>Areas With Few Alternatives</u>	
East central Minnesota .....	+ 6.2
Northwestern Wisconsin .....	+ 2.7
North central Wisconsin .....	- 1.6
East central Wisconsin .....	+ 7.1
West central Michigan .....	+ 7.4
Simple average all areas .....	+ 4.6

soil conditions are unfavorable to alfalfa and the calculated shift was therefore largely to clover and timothy hay.

Detailed estimates from individual farm data were made for each area, although because of variations in cropping and feeding systems and some differences in available data, it was not possible to make these estimates in quite the same way for all areas. The following conclusions were reached: (1) If it were possible to shift all the diverted acreage to alfalfa hay, the increases in feed nutrients would run from 10 to 20 percent; (2) on the other hand, if the diverted acreage were used largely for clover and timothy hay, the new feed nutrients would about balance the total produced before; and (3) if the land were utilized largely for clover and timothy pasture, which has a rather low carrying



capacity, there would be some net decreases in feed nutrients, but the nutrients would be available at the season when they might add the most to the dairy output.

In the areas with few alternatives, because of the need for intensive use of the cropland, it seemed probable that the emphasis would be placed on the kinds of crop shifting that would tend to yield the largest farm-raised feed supply. In the areas where successful stands of alfalfa cannot be obtained, improved yields of hay can be secured with more frequent seedings of red clover and alsike, and perhaps through the use of lime and fertilizer.

### The Effect on Milk Output

The next step was to estimate the effect on the dairy output if all the changes in the feed supply were reflected in the dairy ration. For the Minnesota and Michigan areas estimates were made for each of the individual farms on which complete crop, feed, and livestock data were available. For northeastern Iowa and the Wisconsin areas, attention was centered more on the entire area and fewer individual farm estimates were made.

A summary of all the estimates indicated that in areas such as northeastern Iowa, where the average production per cow is low, the increased quantity of available feed nutrients and the increased quality of the roughage would considerably more than offset the effect of less concentrates. Consequently, the percentage increase in dairy production was estimated to be somewhat greater than the increase in the feed supply. An increase of 4 or 5 percent in butterfat production was expected.

In areas further advanced in their dairy development, and with higher average production per cow, the effect of decreasing the quantity of concentrates in the ration was expected to be more important. However, such areas appeared to be more likely to shift the diverted acreage into alfalfa. Therefore, there would be an increase in feed nutrients, even though this would be followed by a smaller increase in butterfat production because the reduced concentrate feeding would not be fully offset by the higher quality of the roughage. Here there would also be the alternative of combining the increased quantity of roughage with more purchased concentrates. The economy of such a practice would largely depend upon price relationships between butterfat and feed.

It seemed probable that those Minnesota, Wisconsin, and Michigan areas which would have an opportunity of shifting a large part of their diverted acreage to alfalfa might increase their butterfat production from 2 to 5 percent as a result of the changes in the farm food supply.

On the whole, the changes that were estimated to result from the program seemed to be in line with the long-term advantage of the areas concerned. The inducement for increasing the acreage in legumes would accelerate the existing trend in that direction.

As these estimates were made in 1937, much of the 5- or 6-year period considered has already passed. An exact check on what has actually happened in the areas studied cannot be made unless farm records are obtained from the same areas. But it may be pointed out that the general changes that have occurred in the Midwest Dairy Region since 1935 are substantially in line with those that were estimated. If anything, the estimates were too conservative. Milk production in the States of Minnesota, Michigan, Wisconsin, and Iowa increased nearly 15 percent from 1935 to 1940. The shifts in crop acreage have been somewhat different than those estimated, but the changes that have occurred have resulted in a total supply of feed nutrients from crops in 1940 about 13 percent above that in 1935. The supply of pasture feed also increased. In other words, the actual increases in the four States in feed nutrients and milk production have been about twice as great as those estimated for the sample areas. The estimates, of course, did not take account of changes such as hybrid corn and other factors affecting yields of feed crops, nor of additional feed released by the substitution of motor power for draft animals. Neither was the influence of possible changes in price relationships considered.

#### COMPETITION IN DAIRYING BETWEEN THE GREAT LAKES STATES AND NEW ENGLAND

The intensive procedure described earlier has been applied to a study of interregional competition in dairying in two major dairy regions, the Great Lakes States and New England. The areas selected for study are shown in figure 3. As the study is not complete for all areas, conclusions discussed here are not final. The findings for two areas in Wisconsin and one area in Vermont which have been completed for publication will be considered. These are representative of the principal trends in these two important dairy producing States.

##### Dairying in Vermont

Dairying is the principal agricultural enterprise of New England. An area extending over Vermont, New Hampshire, and southern Maine produces the greater part of the fluid milk and cream supply of Boston. Here it comes into competition with cream shipped from the Midwest. Within the Boston milkshed the greatest concentration of dairy farms and milk production is found in Vermont.

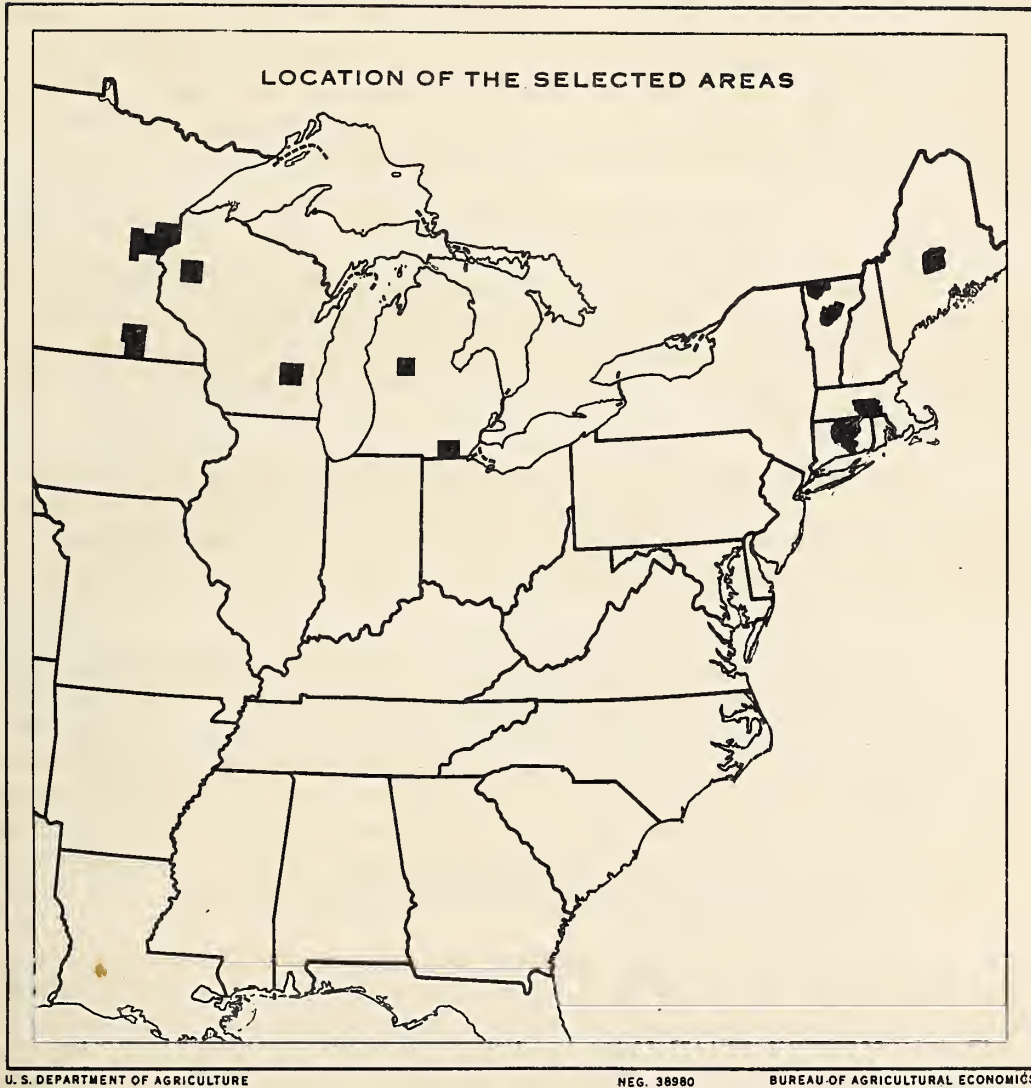


FIGURE 3.- LOCATION OF THE AREAS SELECTED FOR STUDY IN  
THE GREAT LAKES STATES AND NEW ENGLAND.



If we look back over the last 40 years and examine the historical changes in dairy production in northern New England, we find that (1) total milk production appears to have fallen off and then recovered, and (2) a significant shift from butter to fluid-milk production has occurred. Since 1917 milk production in Vermont appears to have increased almost steadily as measured by receipts of milk and cream at Vermont dairy plants (fig. 4). During this time the transition from cream to milk was proceeding rapidly, and by 1937 fluid milk made up 90 percent of the total receipts. This shift has been much the same in all counties in Vermont except on the western side of the State, which shifted to milk earlier in response to the expansion of the New York market.

#### The Cabot-Marshfield Area

The Cabot-Marshfield area lies in north-central Vermont in the Central Plateau, the largest agricultural area in the State (fig. 5). It is highly specialized in dairy farming. Maple products, wood and timber, potatoes, and poultry products form minor sources of income.

Farm-management records for individual farms were obtained in 1926 and again in 1936, and records of milk deliveries were obtained for all years beginning in 1922. It has thus been possible to follow the history of changes in production in considerable detail on individual farms.

During the years from 1926 to 1936 milk production in the Cabot-Marshfield area apparently increased about 6 percent. On 120 individual farms for which records were available for comparison, the increase was 11.5 percent. This was brought about by an increase of 5.5 percent in cow numbers and 5.6 percent in production per cow, and appears to represent the situation for those farms continuing in operation. But as some of the poorer farms were abandoned, the net increase for the area was only about 6 percent.

The increase in production was made possible by increases in feed available to cows. Some feed formerly used by horses was released by the replacement of horses with trucks and tractors. Some increase in feed raised was obtained by the use of additional lime and fertilizer and by a larger proportion of annual crops. Furthermore, the quality of the ration was apparently improved by a larger proportion of millet and silage and some increase in the average quality of the hay crop. These factors, together with an increase of about 100 pounds per cow in the rate of grain feeding, are sufficient to account for the increase in production over the 10-year period. Some improvement in the quality of the cows and a more rapid rate of replacement may also have contributed.



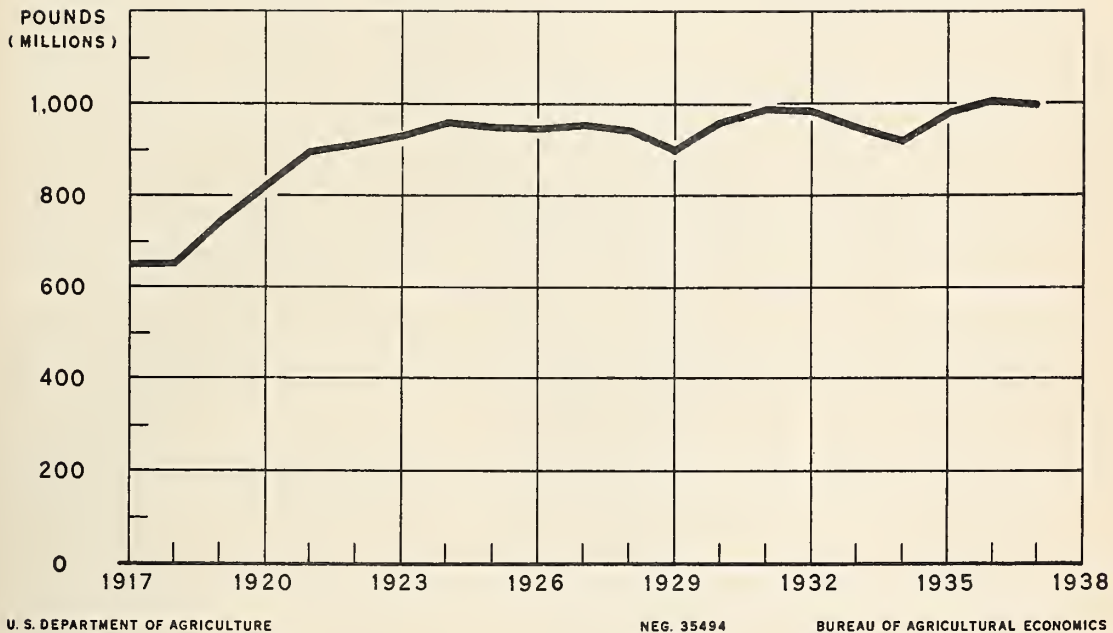


FIGURE 4.- TOTAL RECEIPTS OF MILK AND CREAM BY VERMONT DAIRY PLANTS 1917-37 (MILK EQUIVALENTS).

The trend of receipts of milk and cream by Vermont plants has been upward since 1917 with one break in 1928 and 1929 and another in 1933 and 1934. The apparent sharp increase during the early portion of this period may be in part the result of more complete reporting after the first few years. (Butterfat in cream converted to whole-milk equivalents on the basis of 4-percent butterfat content which was the approximate average for the State.)

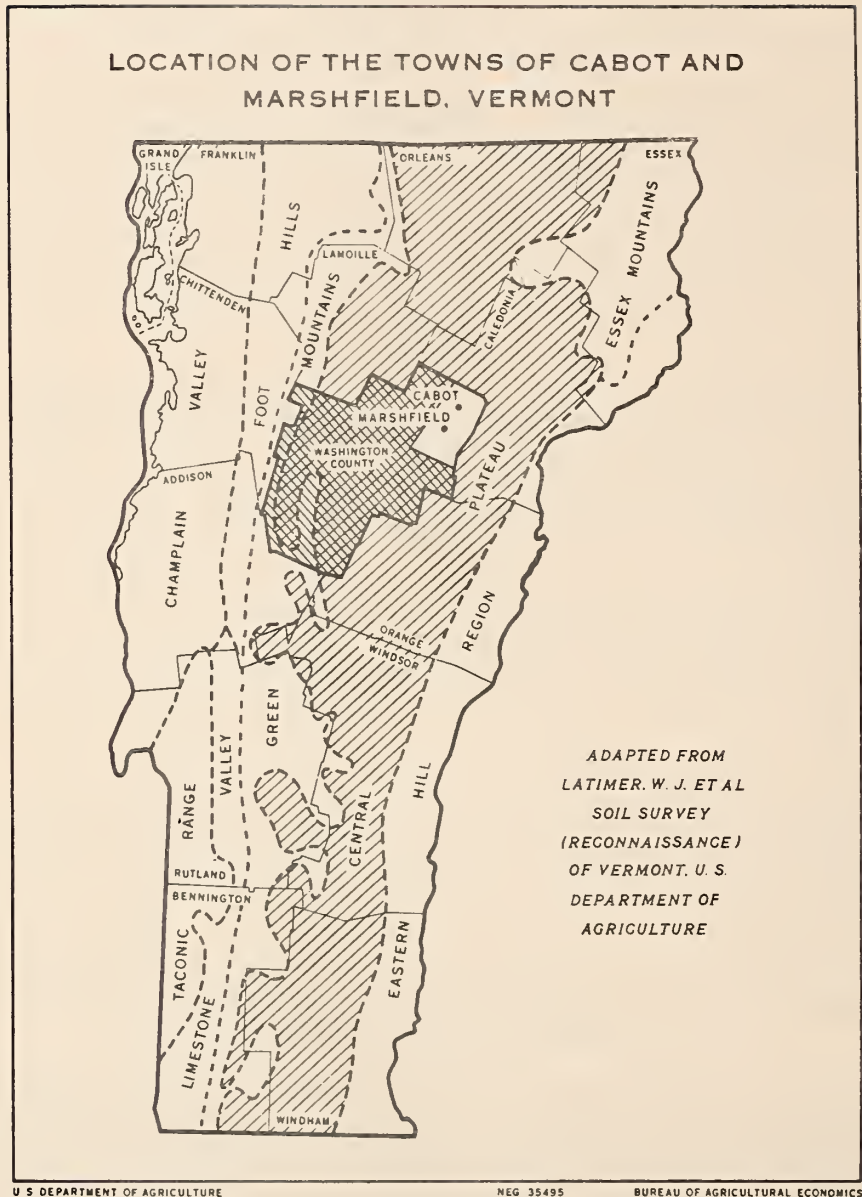


FIGURE 5.- LOCATION OF THE CABOT-MARSHFIELD AREA.

From 1926 to 1936 most dairymen in Cabot-Marshfield shifted from cream to milk deliveries. As a result, hog production and fattening of veal calves, formerly carried on with the assistance of skim milk, were mainly given up.

Poultry raising practically doubled in importance as many small family flocks disappeared and were replaced by a relatively small number of commercial poultry flocks. On most of the farms where this occurred the dairy enterprise was not particularly affected.

Milk production in the Cabot-Marshfield area from 1926 to 1936 and the estimated trends as determined by budget analysis are shown in figure 6. The broken lines in the figure represent the actual trend in production to 1936 and the estimated probable trends from 1936 to 1946, corresponding to the three different price possibilities considered. A represents present (1936 normal) price relationships, B 15-percent-higher milk prices relative to other prices, and C 15-percent-lower milk prices. The solid line represents the actual course followed by production. The actual production year by year from 1936 to 1946 will not follow a straight line. The 1946 point therefore is an estimate of what production will be, if weather and other conditions are about normal and if milk prices most of the time from 1936 to 1946 tend to be in the neighborhood of the appropriate one of the price situations considered. In the A and B price situations and to some extent in C, it is estimated that there will be an increase in roughage production resulting from improved cropping practices. The Agricultural Conservation Program has greatly stimulated a movement in this direction that was already under way. On 26 selected farms for which particularly complete budgets were constructed, careful maps and soil tests of the various fields were made to estimate the feed production possibilities. The greater increase in the B situation over A is related to an estimated increase in grain feeding as well as to greater adoption of improved cropping practices. The decrease in C is related to decreased grain feeding, to less adoption of improved cropping practices, and to a somewhat greater rate of farm abandonment.

So far as the principal forces in operation are concerned, the findings for the Cabot-Marshfield area are believed to have general application to much of Vermont. Aside from prices, improvements in cropping practices involving liming and fertilizing are expected to be major determinants. Farm abandonment is also a factor to be reckoned with in most of Vermont.

#### Dairying in Wisconsin

Wisconsin leads all States in dairying. Almost three-fourths of its farms were classified as dairy farms in the 1930 Census and about 60 percent of the gross farm income for the State during the 10-year period 1928-37 came from the dairy enterprise. Other

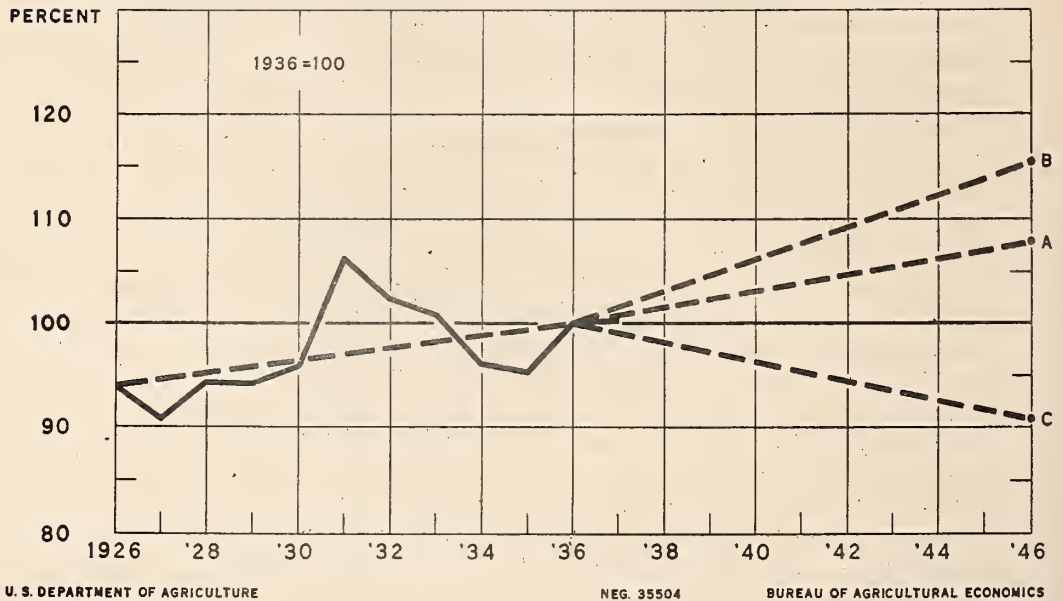


FIGURE 6.- MILK PRODUCTION IN THE CABOT-MARSHFIELD AREA AND PROBABLE FUTURE TRENDS.

Milk production fluctuated considerably between 1926 and 1936 but was at a higher level at the end than at the beginning of the period. The trend from 1936 to 1946 as estimated for A (1936 prices) conditions has about the same slope as the actual trend from 1926 to 1936. (The broken lines represent the actual trend in production from 1926 to 1936 and the estimated probable trends from 1936 to 1946, corresponding to the three price possibilities considered.)



enterprises are usually supplementary to dairy, and, in general, their importance decreases as one moves north in the State.

Over the last 40 years total milk production in Wisconsin appears to have followed a steady upward trend (fig. 7). During this time a significant shift from farm to factory production of butter, cheese, and other dairy products has occurred. Fluid milk for city consumption, especially in the southeastern part of the State, has also become more important.

It is important to point out a few of the underlying production trends that help to explain the continuing upward movement of milk production in Wisconsin. The first and most important of these is the trend toward an increased production of nutrients from forage crops, mainly through an increase in the proportion of higher yielding legume hays in the tame-hay acreage. For the State, as a whole, it has been estimated that the normal yield of tame hay had increased about 11 percent by 1938 as compared with the 1928-32, 5-year average yield. This change is continuing and will probably go further under the impetus furnished by the Agricultural Conservation Program.

Wisconsin corn yields have already been increased substantially by the use of hybrid seed corn, and by 1945, will perhaps have been increased from 15 percent to 20 percent on 75 percent of the total corn acreage.<sup>12/</sup> This will, of course, have most effect on feed supplies in the southern part of the State.

Other innovations also will have some measurable effects on production. For example, recent improvements in silage- and hay-making machinery may make possible a reduction of the labor involved in these operations and perhaps an increase in nutritive yields per acre.

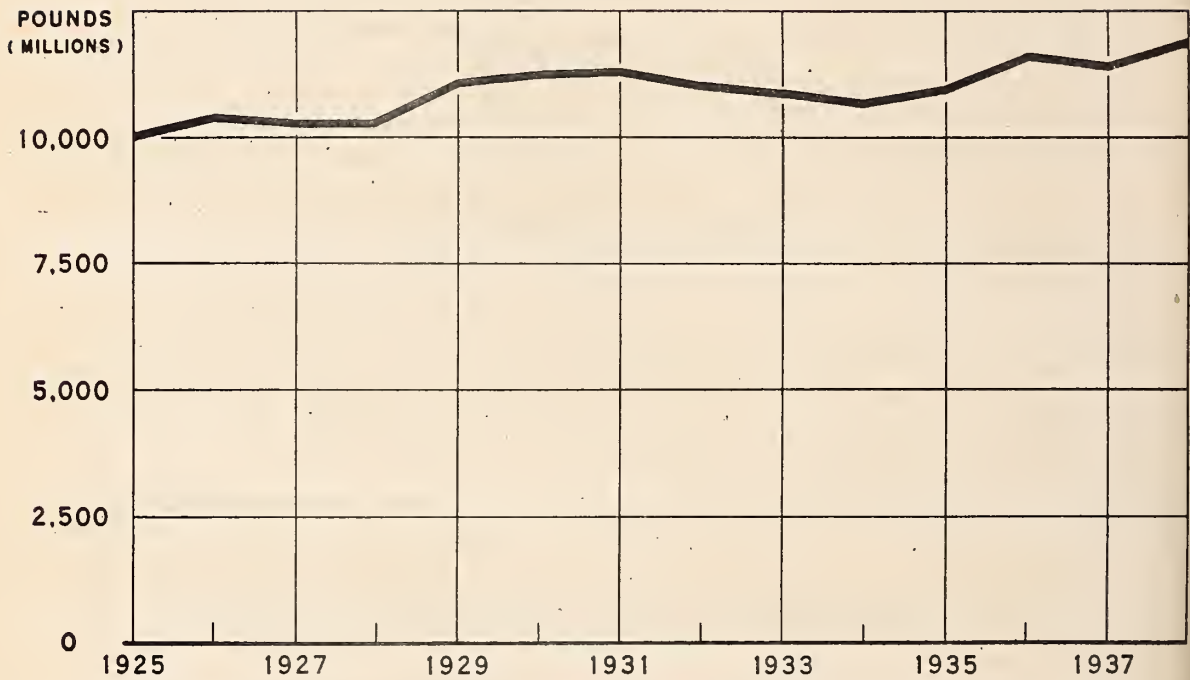
#### Dodge County and Barron County

The two areas selected for intensive study are shown in figure 8. Barron County in northwestern Wisconsin represents an area in which supplementary enterprises play a minor role. Dodge County in southeastern Wisconsin lies on the margin of the Corn Belt and has several supplementary enterprises of some significance.

The production results of the budget studies in these two areas are presented in figures 9 and 10. These studies were carried out according to the same general procedure as indicated for the Vermont Area.

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<sup>12/</sup> Dowell, A. A. and Jesness, O. B. "Economic Aspects of Hybrid Corn." Jour. Farm Econ. 21: 479-488. 1939.

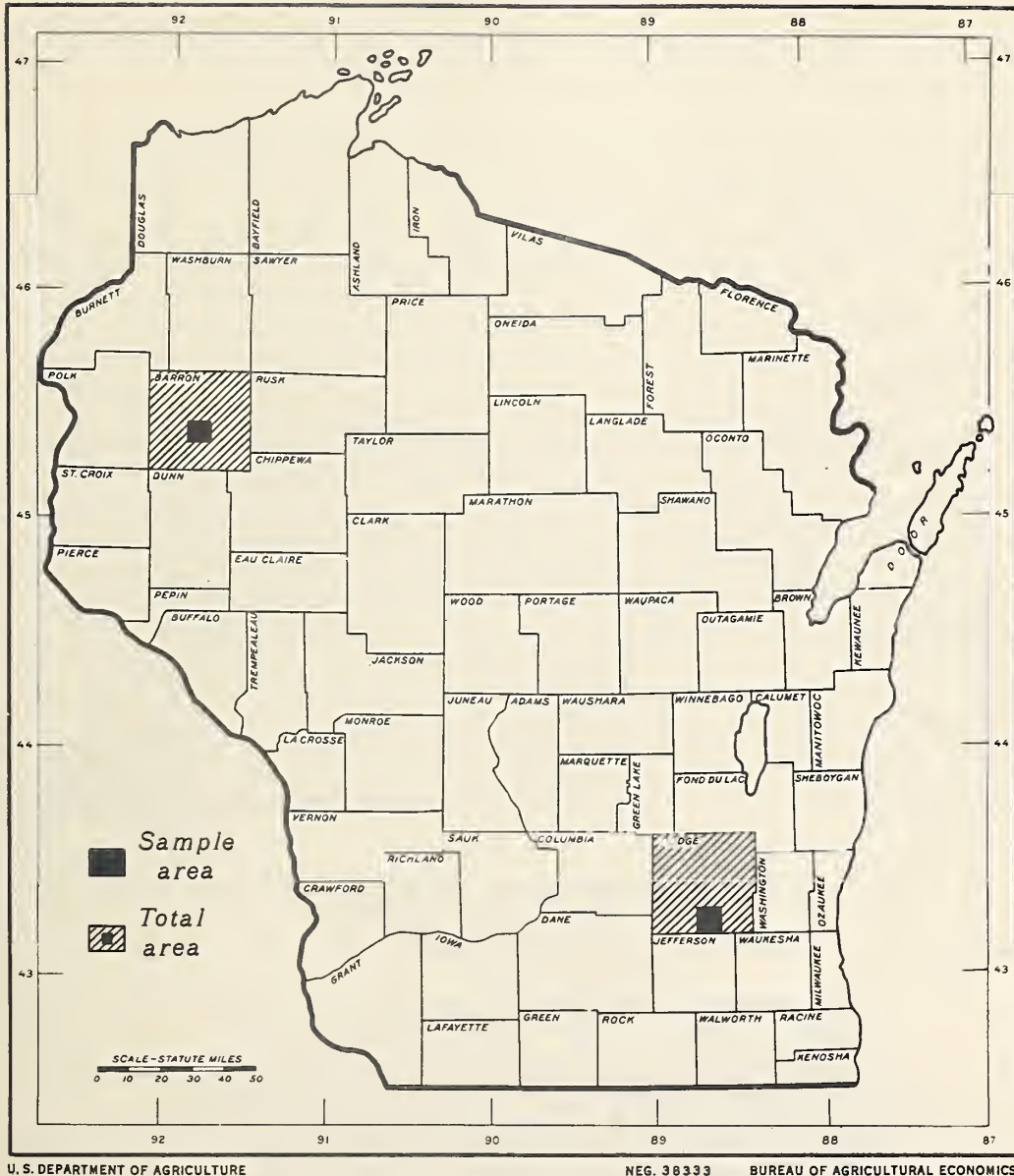


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FIGURE 7.- TOTAL MILK PRODUCTION IN WISCONSIN, 1925-38.

The trend of milk production in Wisconsin has been upward since 1925 with one significant recession in the 4-year period following 1931 associated with depression and drought conditions. Production in 1938 was about 18 percent greater than in 1925.



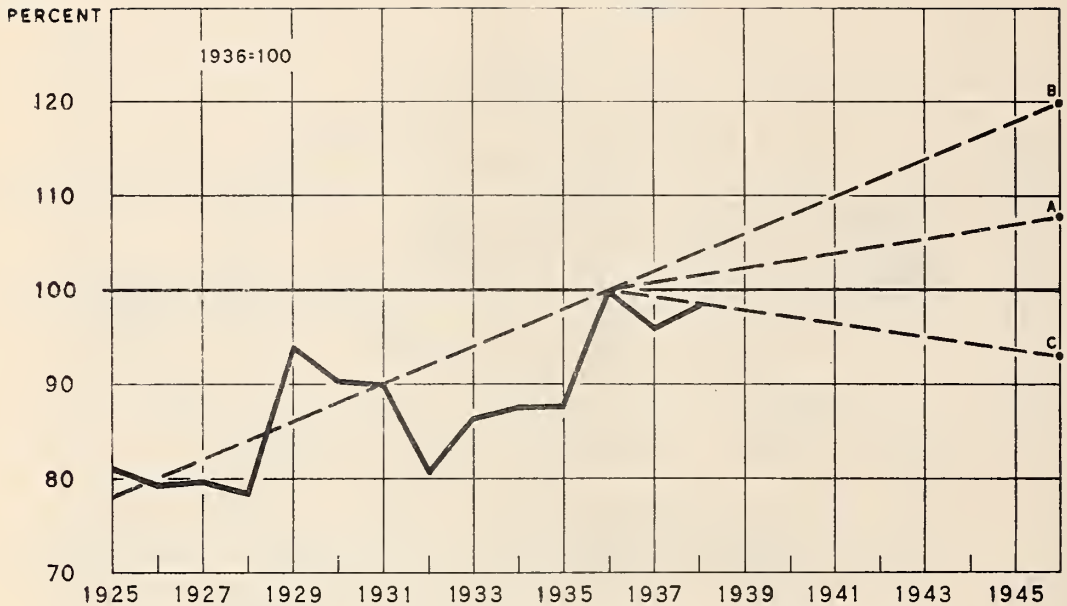
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FIGURE 8.- LOCATION OF THE AREAS STUDIED IN DODGE AND BARRON COUNTIES, WISCONSIN.

Detailed farm records were obtained from individual farmers in Emmet Township in Dodge County and Maple Grove Township in Barron County.



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FIGURE 9.- MILK PRODUCTION AND PROBABLE FUTURE TRENDS, DODGE COUNTY.  
(1936 = 100)

Milk production fluctuated considerably between 1925 and 1936 but was at a definitely higher level at the end of the period. The trend line for normal production is drawn so as to end at the 1936 production point as this has been estimated to be normal for 1936. The estimated trend to 1946 for A conditions (continuation of 1936 normal price relationships) has somewhat less slope than that from 1925 to 1936, the trend for B conditions (higher prices) about the same slope. For the lower price C conditions the estimated trend is downward.



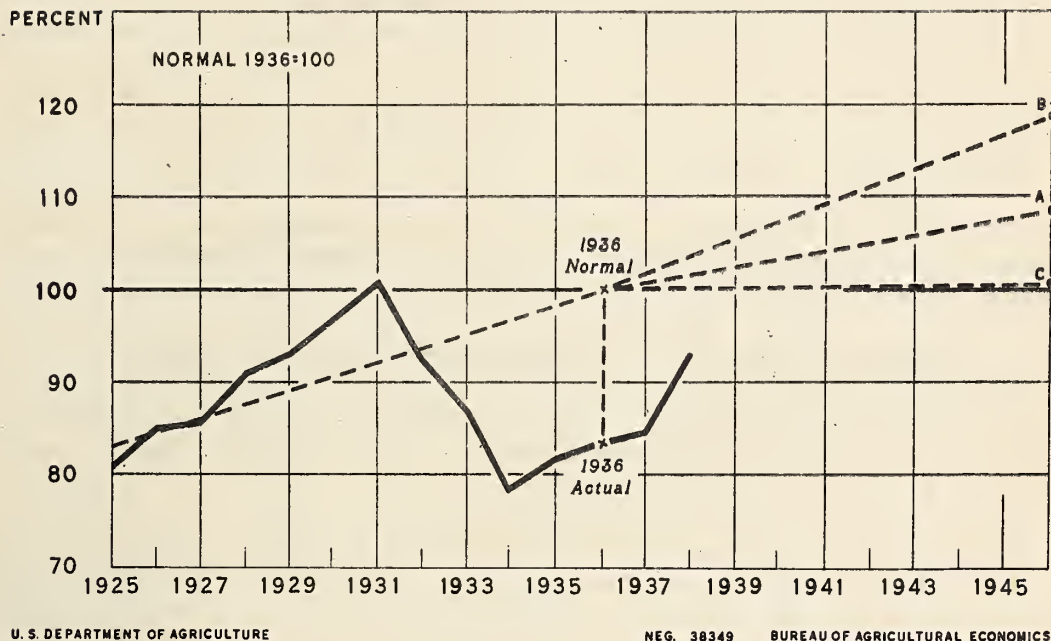


FIGURE 10.- MILK PRODUCTION AND PROBABLE FUTURE TRENDS,  
BARRON COUNTY.  
(Normal 1936 = 100)

After adjusting actual 1936 production for normal weather, it is estimated that a continuation of 1936 price relationships will result in a normal 1946 production about 9 percent higher than the 1936 normal. The broken trend line from 1925 to 1936 represents the trend in normal production and is drawn so as to end at the 1936 normal production point. Milk prices 20 percent higher will probably bring a still higher output. Milk prices 20 percent lower will result in little change from present normal production.

Dodge County. In Dodge County a substantial increase in production occurred between 1925 and 1936. Study of the period indicates this increase was made possible mainly by an increase in the normal feed production of the county. The introduction of more high-nutrient-producing crops, such as alfalfa and other legumes, and some expansion in crop acreage made the change possible. Price relationships did not change much during the period, and no perceptible shift of resources from the production of other products to milk could be discovered. The trends of production estimated for the period ahead as indicated in figure 9 consider possible price relationships. The alternative production possibilities in hogs, poultry, and cash crops in this area explain the spread between the A, B, and C points in the figure. The individual farm budget estimates indicated that these alternatives made for more flexibility in this area than in Barron County.

The upward trend estimated for a continuation of the same prices (to A) is the result mainly of an expected further increase in alfalfa and total feed production.

Barron County. In Barron County the period from 1925 to 1936 witnessed a shift away from the minor enterprises such as hogs and potatoes. The area became more specialized in dairying in spite of little change in price relationships. The pressure of lower farm incomes probably was responsible for this adjustment. Because of drought effects, the actual milk production in 1936 was reduced below a normal level. After adjusting crop yields and milk production to normal weather conditions, a considerable rise in the normal milk-producing capacity of the area appears. This has been due to an increase in both the acreage in crops and in increase in alfalfa and silage, higher yielding roughages. In addition the decrease in supplementary enterprises released some feed for dairy cows.

Based on careful individual farm budget estimates for the period ahead, it appears that, with average prices, further increases in feed and milk may be expected. With lower milk prices, not much change from 1936 normal production may result because of the lack of profitable alternatives in the area.

#### INTERAREA COMPARISONS

A preliminary comparison of findings for the two Wisconsin areas and the Cabot-Marshfield Vermont area is shown in table 3. As the other area studies are completed, the conclusions to be drawn will be modified. But at this stage several statements can be made with some assurance.

Table 3.- Past trends and estimated future responses, at different prices, in normal milk production for selected areas <sup>1/</sup>

(1936 normal = 100)

Area	: 1926 : : normal :	: 1936 : : normal :	: A :	: B :	: C :
Cabot-Marshfield, Vermont	: 94.0 :	: 100.0 :	: 108.8 :	: 116.7 :	: 90.5 :
Dodge County, Wisconsin	: 79.3 :	: 100.0 :	: 107.8 :	: 119.9 :	: 93.0 :
Barron County, Wisconsin	: 84.8 :	: 100.0 :	: 108.6 :	: 118.2 :	: 100.8 :

<sup>1/</sup> The B and C milk prices used in Wisconsin were 20 percent higher and lower, respectively, than A prices. Those used in Vermont were varied by only 15 percent. This is because the Vermont farm prices are on a higher level and are more largely influenced by Class I prices for fluid milk. This is a rough correction for the fact that a given absolute change in the milk price structure results in a larger percentage price change in Wisconsin than in Vermont.

An upward trend in milk production is estimated in both States with 1936 normal milk prices or higher. For the higher prices the upward trend appears somewhat greater. With lower prices, the greatest decrease in production occurs in the Vermont area, where more dependence is placed on purchased feed and where farm abandonment would operate more rapidly.

Production would apparently fall off nearly as much, however, in Dodge County, Wisconsin, as dairymen would turn more to alternative enterprises. In Barron County, the alternatives are not favorable even with lower milk prices, and it is estimated that production would remain near the 1936 normal level.



## APPLICATIONS TO AGRICULTURAL PLANNING AND DEPARTMENT PROGRAMS

All the indications from the interregional analysis of dairying point to increased milk production nationally. Unless consumption expands sufficiently, dairy prices and dairy farmers' incomes may be affected adversely. Agricultural planning should, therefore, emphasize means of stepping up consumption of dairy products through less expensive distribution channels and lower prices to low-income groups. This line of action would seem especially desirable as it would not only expand the market for dairy products, but would also contribute materially to the health and well-being of disadvantaged groups. Such action would promote the national defense objective of an adequate diet for all.

The interregional competition studies throw light on the relative advantages of different producing areas and the possibilities of making individual farm adjustments to reduce costs and increase farm income even in the face of increasing competition. The analysis indicates that with lower milk prices, farm incomes can be maintained in some areas by expanding alternative enterprises. In other areas where conditions are such as to place alternative enterprises at a relative disadvantage, major attention should be devoted to soil-building practices and cropping systems that will improve roughage yields and provide more feed for dairy cows. In marginal areas where some farms eventually will be abandoned or consolidated, assistance may need to be given to displaced farmers in finding other locations or occupations.

### County Agricultural Planning

Results of research in interregional competition in dairying apply directly to county planning in judging the probable future competitive situation for dairy products. As pointed out earlier, the local planner is not usually in a very good position to estimate the impact of external factors on local agriculture. And this is the point at which the results of interregional analysis can be most helpful to him. Studies of production trends not only in his own but other regions will greatly improve the estimates of relative prices which he must make in developing plans for desirable local adjustments.

### Agricultural Conservation Programs

The special study of the probable effects of the Agricultural Conservation Program in the Midwest dairy region has been of value in estimating the effects on milk production and in suggesting modifications in the program.

A comparison of the interregional effects of improved corn yields resulting from hybrid corn in the Corn Belt and similar changes in tame-hay yields indicates that changes in feed supply from improved hay and forage in recent years are nearly as great as those resulting

from hybrid corn. <sup>13/</sup> This conclusion has a direct bearing on conservation programs especially in suggesting modifications in the over-all production objective and its application to particular areas.

### Columbia Basin Irrigation Project

The general approach and research procedure for studying conditions of supply and demand developed in the Interregional Competition Project have a direct bearing on the investigations planned for developing a program for the settlement of the Columbia Basin Irrigation Project. Suggestions have been made which will be of material assistance in carrying out the joint studies for that and similar projects. An initial investigation is to determine the types of farm economy best suited to the project area in view of the soils, climate, and competitive relationships with other irrigated and non-irrigated areas. Foreseeable market conditions and prospective relative prices become one of the most important elements in the problem.

### PUBLIC INFORMATION ASPECTS

The above instances are examples of direct applications to agricultural planning and department programs. The results, and the clarification and extension of the economic principles upon which they are based, have the significant further possibility of leading to a more adequate understanding on the part of agricultural leaders and the public of the forces which further or impede regional shifts in agriculture. It is perhaps in this way that the greatest assistance will in the end be given to agricultural programs as well as to individual farmers.

Under the "democratic process" agricultural programs cannot rise much above the level of general understanding and common consent. It is probable that if the principle of comparative advantage were generally understood and acted upon in this country, barriers to internal trade would almost completely disappear, and agricultural programs would more nearly achieve their desired social objectives. State, national, and private business controls that affect the regional distribution of production are continually being erected for the immediate benefit of particular group interests and at the expense of the general welfare. If such barriers and impediments to free internal trade and adjustment to underlying natural advantages were permitted to multiply for any length of time, the average level of living in the United States would decline materially.

Therefore, the need is for a fully informed and enlightened public opinion on the question of comparative advantage and the benefits to be derived from regional specialization in production and

<sup>13/</sup> Highell, Ronald L. "Economic Aspects of Hybrid Corn--Further Considered." Jour. Farm Econ. 21: 661-665. 1939.

from interregional trade. With this improved understanding, more effective programs and institutions for improving economic welfare can be developed.

#### THE NATIONAL DEFENSE PROGRAM

Regional adjustments in agriculture to meet the impacts of the National Defense Program and to assist the defense effort will probably occupy the attention of the Bureau of Agricultural Economics for some time to come. How can interregional competition analysis contribute most effectively to this major line of defense interest?

War and Defense place a tremendous premium on time and timeliness. The results of research must meet this test. Attention must of necessity be focused on methods and procedures that produce results on time. This does not mean that all long-time research should be sacrificed. Some problems, in their very nature, will not yield usable results in the short run. To withdraw all support from such projects would be comparable to giving up the building of all battleships that will not be completed earlier than 1942. The Nation may need the results of long-time research maturing in later years just as it may need the great ships of war.

But it does mean that special attention now needs to be devoted to developing procedures that yield timely results on significant problems that must be faced now. These procedures are the destroyers that are needed for immediate convoy duty.

Some very important regional adjustment problems have been brought to a critical point by the impact of war and defense. Adjustments of these problems will be made. The Bureau of Agricultural Economics as a research and planning agency is now organized to play a leading role in determining the desirable adjustments, region by region, and area by area. Interregional competition analysis can be very helpful in this process by estimating the regional and over-all production and consumption trends. This would include analysis of the probable effects of existing agricultural programs and of proposed modifications by regions. The probable effects of the new programs for getting food to low-income groups and for lowering distribution costs should be estimated at the same time.

These analyses need to be made on a broad basis and for a number of commodities simultaneously. The findings for both production and consumption trends need to be made currently available to local planners. Conclusions need to be continually revised in the light of new developments as they appear.



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